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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/621,637	07/17/2003	Yonsheng Shen	011361.00065	2587

22910 7590 11/12/2010

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EXAMINER	
OLSEN, KAJ K	

ART UNIT	PAPER NUMBER
1724	

MAIL DATE	DELIVERY MODE
11/12/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/621,637	SHEN ET AL.	
	Examiner	Art Unit	
	KAJ K. OLSEN	1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 September 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-67,70-74 and 76-133* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-67,70-74 and 76-133* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Reissue Applications

1. In accordance with 37 CFR 1.175(b)(1), a supplemental reissue oath/declaration under 37 CFR 1.175(b)(1) must be received before this reissue application can be allowed.

Claims 1-67, 70-74, and 76-133 are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251. See 37 CFR 1.175. The nature of the defect is set forth above.

Receipt of an appropriate supplemental oath/declaration under 37 CFR 1.175(b)(1) will overcome this rejection under 35 U.S.C. 251. An example of acceptable language to be used in the supplemental oath/declaration is as follows:

> "Every error in the patent which was corrected in the present reissue application, and is not covered by a prior oath/declaration submitted in this application, arose without any deceptive intention on the part of the applicant."

See MPEP § 1414.01.

Res Judicata

2. Claims 1, 2, 9-12, 29-34, 52, 54, and 61-64 of this reissue are identical to the claims 1, 2, 9-12, 29-34, 52, 54, and 61-64 presented to the Board of Appeals in Reexamination 90/006,209. The rejection of these claims was affirmed in the Board decision of 3/28/2007. Hence, the claims 1, 2, 9-12, 29-34, 52, 54, and 61-64 are rejected on the grounds of *res judicata* and the applicant is not entitled to further adjudication of the issues concerning these claims.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 5, 9, 11-13, 29-34, 52, 53, 57, 61, 63-65, 67, 71, 73, 77, 78, 82, 86, 88-90, 106-113, 117, 121, and 123-127 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey (USP 4,227,984) in view of Uchida (USP 5,474,857), Grot (5,330,860), and/or Vanderborgh et al (USP 4,804,592).

6. With respect to claim 1, Dempsey discloses an electrochemical gas sensor comprising a sensing electrode 13 and a counter electrode 10 both of which are permeable to water vapor and are inherently comprised of electrically conducting material (col. 4, lines 30-64). Dempsey further discloses a first protonic conductive electrolyte membrane 9 permeable to water and situated between and in contact with the sensing and counter electrodes (fig. 2, and col. 4, lines 49-51), and also discloses a means for electrical measurement electrically connecting the sensing and counter electrodes (fig. 3). Dempsey further discloses a means, containing a volume of water (1, 2), for exposing the counter electrode to water vapor (col. 4, lines 39-49). Dempsey does not explicitly disclose the use of sensing and/or counter electrodes having the set forth

composition of electron conductive mixed material and proton conducting material, Dempsey did recognize that electrodes set forth in the fuel cell prior art would find utility for the sensor of Dempsey (col. 8, lines 30-63). Uchida teaches a particular electrode for use in fuel cells that comprises a combination of proton conducting material (i.e. Nafion) and carbon and platinum materials (col. 7, line 55 through col. 8, line 26) that satisfies the claimed percentages (see Reexamination 90/006,209 Request dated 1/29/2002, pp. 4 and 5). Grot also teaches the use of fuel cell electrodes having the claimed compositions (col. 4, line 35 through col. 5, line 2; and col. 14, lines 15-27). Vanderborgh also teaches the incorporation of electrolyte material (polyperfluorosulfonic acid (PFSA)) into the electrode material into the electrode to increase the three phase interface and reduce the electrode resistance. See col. 2, ll. 37-43. Vanderborgh further teaches that such as electrode should includes first and second electrical conductors (C and Pt) that is 82 wt% where the proton conducting material PFSA is 18 wt%. See Table 1 in col. 8. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of any of Uchida, Grot, and/or Vanderborgh for the sensor of Dempsey because these electrodes have shown previous favorable utility in the fuel cell art, and the substitution of one known fuel cell electrode composition for another, when the results are not unexpected, requires only routine skill in the art. Furthermore, the addition of an ionically conductive polymer to the electrodes of Dempsey would improve the electrical properties (e.g. decrease the effective electrode resistance (col. 2, ll. 42 and 43 of Vanderborgh or col. 4, lines 26-29 of Grot). Although Vanderborgh, Uchida and Grot are drawn principally towards fuel cell power sources, both Uchida and Grot recognized the utility of their teachings to include fuel cell sensors like those of Dempsey (see Uchida, col. 10, lines 60-64; and Grot, col.

1, lines 19-30). In addition, Dempsey recognized the utility of teachings from the general fuel cell art for the disclosed sensor (col. 8, lines 30-63).

7. With respect to claim 5, Figure 1 of Dempsey shows opposing surfaces where each surface has a sensing and counter electrode respectively. Moreover, fig. 1 also shows the working and counter electrodes embedded into the electrolyte membrane resulting in a nonplanar portion of the membrane at the point of the embedding. See fig. 1. This would read on the claimed "substantially nonplanar" membrane giving the claim language its broadest reasonable interpretation.

8. With respect to claims 9 and 11, see Dempsey col. 6, l. 66 - col. 7, l. 16.

9. With respect to claim 12, all of Uchida, Grot, and Vanderborgh taught the use of a combination of carbon and Pt with Pt and C in the claimed ratios. See Uchida, col 7, ll. 59-62; see Grot, col. 14, ll. 15-27; see Vanderborgh, Table 1. Moreover, Vanderborgh explicitly taught the use of carbon black as the preferred source of carbon for the electrodes as it provides a high surface area. See col. 8, ll. 16-28. Hence, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize carbon black as the source of carbon for the electrodes of Uchida and Grot as well as carbon black provides a high surface area support that would maximize the utility of the highly expensive Pt metals.

10. With respect to claim 13, Dempsey describes electrodes formed from noble metals and in particular platinum metals (col. 7, l. 65 - col 8, l. 1) and ruthenium (Ru) is a platinum group metal and a noble metal. Further Grot identifies ruthenium and reduced oxides thereof as a suitable catalytic material that may be used with a carbon black support, such as that sold under the VULCAN trade designation (col. 4, ll. 56-61). One of ordinary skill in the art would have

been motivated to form an electrode having the claimed percentages of ruthenium oxide and carbon black as Dempsey describes electrodes formed from noble metals and as Grot and Uchida teach that suitable electrodes for gas sensing applications may be formed having the claimed percentages of noble metals, such as ruthenium oxide, and carbon.

11. With respect to claims 29-34 and the use of the sensor for CO, alcohol, or NOx, see the Dempsey abstract. With respect to the use of the sensor with the gases hydrogen, H2S, and H2O, that is only the intended use of the apparatus and the intended use need not be given further due consideration in determining patentability. The examiner would note that the applicant gave no other electrode compositions for the detection of hydrogen, H2S or H2O, indicating that the electrodes already set forth for the CO sensor would also be applicable for the other claimed compositions.

12. With respect to claims 52, 57, 61, 63 and 64 (those limitations not covered above) Dempsey also teaches the use of a reference electrode for the sensor (col. 4, lines 60-65) as well as a reservoir 1 containing both water and water vapor which would expose the counter electrode to both water and water vapor (col. 4, ll. 30-34).

13. With respect to claim 65, see the discussion of claim 13 above.

14. With respect to claims 53 and 113, Dempsey teaches a means for applying DC potential across the sensing and counter electrodes. See col. 2, l. 36 - col. 3, l. 38. Although Dempsey does not disclose this DC potential as being for the purpose of transporting gas away from the counter electrode, it would clearly be capable of providing said function.

15. With respect to claim 67 and 73 (those limitations not covered above), because the electrode of Dempsey in view of Uchida, and/or Grot already rendered obvious the combination

of catalytic electronic conducting material (e.g. Pt) and ion conducting material (e.g. Nafion) for the electrodes with overlapping composition to the electrodes of the instant invention, then such an electrode would inherently be capable of reacting with a gas in the absence of an applied or biased voltage to the sensing electrode. The fact that Dempsey operates its sensor using an applied voltage to the sensing electrode does not read free of this limitation because whether or not a voltage is applied is how the sensor is to be utilized and does not further define the structure of the device.

16. With respect to claims 71 and 77 (those limitations not covered above), the sensing and counter electrodes of Dempsey are on opposite sides of the first protonic conductive electrolyte membrane. See fig. 1 and 3.

17. With respect to claims 78, 82, 86, 88-90, and 106-111 (those limitations not covered above), whether or not the sensor is operated at room temperature is only the intended use of the apparatus and the intended use need not be given further due consideration in determining patentability. It is noted however that the sensor of Dempsey can be utilized at room temperature as evidenced by col. 2, ll. 30-35. Furthermore, the means for electrical measurement of Dempsey is capable of detecting a change in electrical characteristic (i.e. current) in response to a positive ambient atmosphere concentration. See col. 11, ll. 8-30.

18. With respect to claims 112, 117, 121, and 123-125 (those limitations not covered above), whether or not the sensor is operated at room temperature is only the intended use of the apparatus and the intended use need not be given further due consideration in determining patentability. It is noted however that the sensor of Dempsey can be utilized at room temperature as evidenced by col. 2, ll. 30-35.

19. With respect to claims 126 and 127 (those limitations not covered above), whether or not the sensor is operated as a residential gas sensor merely constitutes the intended use of the sensor and the intended use need not be given further due consideration in determining patentability.

20. Claims 2, 54, 79, and 114 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of Grot, Uchida, and/or Vanderborgh as applied to claims 1, 52, 78, and 112 above, and further in view of La Conti et al (USP 4,820,386).

21. The references set forth all the limitations of the claims, but did not explicitly recite the presence of antifreeze. La Conti teaches adding materials such as glycols (a well known antifreeze) to the water to increase the effective temperature range for the sensor (col. 11, lines 42-49). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of La Conti for the sensor of Dempsey in view of Grot, Uchida, or Vanderborgh in order to increase the temperature range of the sensor.

22. Claims 3, 55, 80, and 115 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of Grot, Uchida, and/or Vanderborgh as applied to claims 1, 52, 78, and 112 above, and further in view of Hielscher et al (USP 5,403,452).

23. The references set forth all the limitations of the claims, but did not explicitly recite that the surface area of the sensing electrode is smaller than the surface area of the counter electrode. Hielscher teaches in an alternate gas sensor that the counter electrode 2 should be larger than sensing electrode 1 (fig. 4 for example) so that the counter electrode's current density is less than the measuring electrode's current density. See col. 8, ll. 38-44. This is in accordance with the point the examiner made previously from Reexamination 90/006,209 (see p. 19 of the 7/17/2003 Examiner's Answer) in that it was known to make the counter electrode larger than the sensing

electrode so that the counter electrode does not diffusion limit the sensor response. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Hielscher and make the sensing electrode smaller than the counter electrode for the sensor of Dempsey and Uchida, Grot, and/or Vanderborgh in order to ensure that the counter electrode's current density is less than the current density at the working electrode thereby ensuring that the sensing electrode is the diffusion limiting electrode.

24. With respect to the remainder of claims, because the counter electrode of Dempsey is directly exposed to water vapor, the humidity would presumably be at or near 100%. Because the humidity at the counter electrode is greater than the humidity at the sensing electrode, a positive pressure of water vapor would be result.

25. Claims 4, 56, 81, and 116 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey and Hielscher in view of Grot, Uchida, and/or Vanderborgh as applied to claims 3, 55, 80, and 115 above, and further in view of La Conti et al.

26. The reference set forth all the limitations of the claims, but did not explicitly recite the use of a hydrophobic membrane separating the counter electrode from the water vapor. La Conti teaches that the placement of a water transport film between an electrode and a source of water vapor allows impure water sources to be utilized (such as the antifreeze taught above) (col. 11, lines 42-49). The water transport film used by La Conti is a hydrophobic polytetrafluoroethylene (col. 3, lines 62 and 63). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of La Conti for the sensor of Dempsey, Hielscher, and Grot, Uchida, and/or Vanderborgh in order to prevent contamination of the counter electrode.

27. Claims 10, 62, 66, 70, 72, 74, 76, 87, 122, and 128-132 (and claims 67 and 73 in the alternative) are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of Grot, Uchida, and/or Vanderborgh as applied to claims 1, 52, 78, and 112 above, and further in view of Tomantschger et al (USP 5,302,274).

28. With respect to claims 10, 62, 87, and 122, the references set forth all the limitations of the claims, but did not explicitly recite the use of a hydrated metal oxide protonic conductor electrolyte. Tomantschger teaches in an alternate gas sensor a number of different electrolyte materials useable for gas sensors including a uranyl hydrogen phosphate tetrahydrate (col. 8, lines 37 and 38). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Tomantschger for the sensor of Dempsey in view of Grot, Uchida, and/or Vanderborgh because the substitution of one known electrolyte means for another, when the results are not unexpected, requires only routine skill in the art.

29. With respect to claims 66, 70, 72, 74, and 76 (those limitations not already discussed above), the references do not teach that the sensing and counter electrodes are the only two electrodes in contact with the electrolyte membrane. Rather, Dempsey teaches the presence of an additional reference electrode. However, Tomantschger teaches that it is unnecessary to have three electrodes for the gas sensor as only two are necessary for appropriate sensor operation. In particular, Tomantschger teaches that the gas sensor can comprise only a sensing and counter electrode where the presence of the gas being analyzed is determined based on an induced sensor response. See fig. 8 and 9; col. 9, ll. 1-19; and col. 10, ll. 10-20. Because this configuration of sensor reduces the number of electrodes and reduces the need for an applied potential across the sensor, it would have been obvious to one of ordinary skill in the art at the time the invention

was being made to utilize the sensor configuration of Tomantschger for the sensor of Dempsey in view of Uchida, Grot, and/or Vanderborgh in order to simplify the sensor construction and operation.

30. With respect to claims 67 and 73 in the alternative, these claims were rejected earlier because the claim language drawn to operating the sensors in a non-biased manner or without applied voltage did not further define the actual structure of the sensor. However, even if these terms were to be interpreted as structurally further defining the claimed sensor, then these claims would be obvious over the further teaching of Tomantschger for the reasons set forth for claims 66, 70, 72, 74, and 76 above.

31. With respect to new claim 128, Dempsey in view of Grot, Uchida, and/or Vanderborgh set forth all the limitations of the claim (see the discussion of claim 1 above) and further disclosed where each of the sensing and counter electrodes would contain a combination of platinum and carbon (see the discussion of claim 12 above). With respect to the new limitations concerning the use of a copolymer having a tetrafluoroethylene backbone with a side chain of perfluorinated monomers containing a sulfonic acid group, col. 8, ll. 43-49 of the specification evidences that Nafion reads on this defined copolymer and Nafion is the polymer that Grot, Uchida, and Vanderborgh utilized in its electrodes. Moreover, Dempsey taught the use of this solid perfluorinated ion-exchange polymer Nafion as its electrolyte for the sensor. See the discussion above and in the previous office action. Dempsey in view of Grot, Uchida, and/or Vanderborgh did not explicitly recite that the sensing and counter electrodes are the only two electrodes in contact with the first protonic conductive electrolyte membrane. However, Tomantschger teaches that it is unnecessary to have three electrodes for the gas sensor as only

two are necessary for appropriate sensor operation. In particular, Tomantschger teaches that the gas sensor can comprise only a sensing and counter electrode where the presence of the gas being analyzed is determined based on an induced sensor response. See fig. 8 and 9; col. 9, ll. 1-19; and col. 10, ll. 10-20. Because this configuration of sensor reduces the number of electrodes and reduces the need for an applied potential across the sensor, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the sensor configuration of Tomantschger for the sensor of Dempsey in view of Uchida, Grot, and/or Vanderborgh in order to simplify the sensor construction and operation. With respect to the sensor being a residential sensor, that is only the intended use of the apparatus and the intended use need not be given further due consideration in determining patentability.

32. With respect to claims 129 and 130, Dempsey utilizes a membrane that is 0.30 mm thick and 16 mm sensing and counter electrodes. See col. 11, ll. 58-67. With respect to the specific use of 15 mm for the sensing and counter electrodes, this is so close to the 16 mm of Dempsey that it constitutes an obvious difference over the area relied on by Dempsey. There is no particular criticality disclosed by the present invention for the specific use of 15 mm, nor is there any criticality to the use of 16 mm by the teaching of Dempsey. With respect to approximately 0.17 mm, finding the optimal thickness requires only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Both the thickness and diameter positions were affirmed in the Appeal decision of 90/006,208.

33. With respect to claim 131, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize at least 25% proton conductor material, since it has been held that where the general conditions of a claim are disclosed in the prior art,

discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Moreover, Grot already teaches that the amount of proton conductor material can already extend up to 25% (col. 4, ll. 3-14).

34. With respect to claim 132, see the discussion for claim 3 above.

35. Claims 66, 70, 72, 74, 76, and 128-132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of Grot, Uchida, and/or Vanderborgh as applied to claims 1, 52, 78, and 112 above, and further in view of Nagata et al (USP 4,913,792).

36. The references set forth all the limitations of the claims, but did not teach that the sensing and counter electrodes are the only two electrodes in contact with the electrolyte membrane. Rather, Dempsey teaches the presence of an additional reference electrode. Nagata teaches an alternate gas sensor having three electrodes equivalent to the three electrodes of Dempsey (i.e. a sensing (or working) 2, a counter electrode 4, and a reference electrode 3). However, Nagata teaches that the sensor could be constructed without the presence of a reference electrode provided one is willing to utilize a suitably large counter electrode. Nagata further teaches that such a configuration would simplify sensor construction. See col. 7, l. 66 - col. 8, l. 11. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of a two-electrode sensor configuration of Nagata for the sensor of Dempsey in view of Uchida, Grot, and/or Vanderborgh in order to simplify the sensor construction.

37. With respect to claims 128-132, most of the limitations of these claims were already rendered obvious by the teachings of Dempsey in view of Grot, Uchida, or Vanderborgh as discussed in the Tomantschger rejection above (see the preceding rejection). These references did not teach that the sensing and counter electrodes are the only two electrodes in contact with

the electrolyte membrane. Rather, Dempsey teaches the presence of an additional reference electrode. Nagata teaches an alternate gas sensor having three electrodes equivalent to the three electrodes of Dempsey (i.e. a sensing (or working) 2, a counter electrode 4, and a reference electrode 3). However, Nagata teaches that the sensor could be constructed without the presence of a reference electrode provided one is willing to utilize a suitably large counter electrode. Nagata further teaches that such a configuration would simplify sensor construction. See col. 7, l. 66 - col. 8, l. 11. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of a two-electrode sensor configuration of Nagata for the sensor of Dempsey in view of Uchida, Grot, and/or Vanderborgh in order to simplify the sensor construction.

38. Claim 133 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dempsey in view of any of Grot, Uchida, and/or Vanderborgh, and either Nagata or Tomantschger as applied to claim 128 above, and further in view of Hielscher.

39. The references set forth all the limitations of the claims, but did not explicitly recite that the surface area of the sensing electrode is smaller than the surface area of the counter electrode. Hielscher teaches in an alternate gas sensor that the counter electrode 2 should be larger than sensing electrode 1 (fig. 4 for example) so that the counter electrode's current density is less than the measuring electrode's current density. See col. 8, ll. 38-44. This is in accordance with the point the examiner made previously from Reexamination 90/006,209 (see p. 19 of the 7/17/2003 Examiner's Answer) in that it was known to make the counter electrode larger than the sensing electrode so that the counter electrode does not diffusion limit the sensor response. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to

utilize the teaching of Hielscher and make the sensing electrode smaller than the counter electrode for the sensor of Dempsey and Uchida, Grot, and/or Vanderborgh in order to ensure that the counter electrode's current density is less than the current density at the working electrode thereby ensuring that the sensing electrode is the diffusion limiting electrode. As to the limitation "whereby a positive pressure of said water vapor exists", absent the explicit recitation of a structural feature that created the positive pressure of water vapor, this limitation only further defines the intended use of the sensor.

Allowable Subject Matter

40. Pending receipt of an appropriate supplemental reissue declaration, claims 6-8, 14-28, 58-60, 83-85, 91-105, and 118-120 would be objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

41. Similarly, claims 35-51 would be allowed pending an appropriate supplemental reissue declaration.

Response to Arguments

42. Applicant's arguments filed September 30, 2010 have been fully considered but they are not persuasive. The examiner's response to the applicant's arguments will begin with the arguments starting in section IV, p. 36 of the response, as sections I and II are a summary of the status of the application and claims and section III is a summary of the arguments applicant makes in detail in section IV. The examiner will also restrict his discussion solely to those

arguments the examiner hasn't previously analyzed. Applicant has included the examiner's 6/14/2010 office action from the prosecution of 10/621,999 as a 9/30/2010 affidavit in this application. This office action addressed many of the arguments being made here and the applicant is invited to consult that office action as well as all the previous office actions for this application for the examiner's response.

43. As a preliminary issue, applicant urges that the examiner is relying on applicant's disclosure for rationale for supporting the rejection over the prior art (items 62, 67 and 69 in the 9/30/2010 affidavit). This assertion is entirely without merits. Nowhere in the prior art rejections does the examiner rely on the applicant disclosure to support the rejection. Item 62 concerns the fact that the specification would evidence that a water vapor humidified electrolyte (which was already taught by the prior art LaConti) would not inherently cause the electrodes to be flooded. The use of applicant's disclosure for evidence is entirely consistent with standard office practice as evidence supporting a rejection can come from applicant's own disclosure (see *In re Fitzgerald, Sanders, and Bagheri* 205 USPQ 594, where the similarity between the prior art process and the present invention process evidence that the claimed conditions would have been inherent for the prior art). In items 67 and 69, the examiner is reciting the applicant's disclosure only to rebut applicant arguments. In particular, applicant was attempting to urge that going from three electrode sensors to two electrode sensor would have required more than ordinary skill in the art (even though both Nagata and Tomantschger suggested doing so), or suggested that one cannot utilized electrode dimensions from a three electrode cell for a two electrode cell (even though applicant utilized the same dimensions for each of its electrodes). It was entirely reasonable for the examiner to look to the applicant's own disclosure to see if these arguments

had any merit. "[T]he examiner must then consider any evidence supporting the patentability of the claimed invention, such as any *evidence in the specification* or any other evidence submitted by the applicant" (MPEP 2142) (emphasis added).

44. With respect to the rejection relying on Uchida, applicant challenges the examiner's interpretation of the claimed "mixed conductive material" by relying on the specification that showed the ionic and electronic conductive materials being mixed together to form a single material that is a mixture of the proton and electron conductive materials. When the examiner pointed out that Uchida would teach this even utilizing applicant's more narrow definition of the claim (see fig. 3 of Uchida), applicant urges that this embodiment where Nafion coated the conductive particles is more akin to marmalade on an English muffin and still wouldn't read on the claim language. This train of argument is unpersuasive for a number of reasons. First, applicant is urging that the precise structure of the disclosed embodiments should be read on the broadly worded claims even though the specification suggests that the scope of the claim should not be so limited by the disclosed embodiments (col. 16, ll. 28-34). Hence, applicant is now essentially urging that the examiner should do what the specification explicitly warned should not be done. Second, if applicant wishes to have the claims be read in such a narrow manner, then why has the applicant not amended the claims as such? Applicant's response was filed with a RCE, which would have given the applicant a chance to have the claims read only in this narrower manner. Third, the whole marmalade-muffin analogy that having one material coating another material wouldn't read on the claimed mixture is confusing considering that the embodiments of col. 15 and 16 of the present invention appear to be precisely analogous to the argued marmalade-muffin analogy. In particular, these embodiments disclose how a Pt/carbon

powder is added to a Nafion solution, which is eventually dried to form the electrode. Wouldn't conductive particles suspended in a Nafion solution that is eventually dried result in conductive particles being coated with the Nafion? Isn't this essentially the same process utilized by Uchida? Compare col. 5, ll. 28-39 of Uchida with col. 15, ll. 36-40 of the present invention.

45. With respect to Vanderborgh, applicant's arguments appear to rely on the fact that the examiner should construe the claims as being only drawn to the disclosed embodiment of a single layer of a mixture of material even though the claims do not specify a single layer or a mixture of material. That was not persuasive for the reasons already discussed in the preceding paragraph.

46. With respect to the teaching of Grot, applicant urges that Grot does not suggest the use of further hydrophobic treatment, as suggested by the examiner, because Grot never identified Teflon as being hydrophobic. This argument is puzzling. Teflon is clearly hydrophobic and clearly would control the wetting ability of any electrode that it is added to. Applicant has been urging since the beginning of prosecution of both the reexamination and reissue that the Teflon added to the electrode of Dempsey renders its electrode hydrophobic. Now applicant wants to urge that it is unclear if the Teflon added to Grot would render this electrode more hydrophobic. This argument in the face of the long prosecution history here is clearly untenable.

47. As to the arguments about surfactants only facilitating wetting of an electrode is also incorrect. Surfactants can render hydrophilic material hydrophobic or hydrophobic materials hydrophilic. For example, Rain X is a commercial surfactant utilized to render a windshield hydrophobic so that water will not stick to it. Hence, surfactants can either improve or reduce the wettability of an electrode. Moreover, the surfactants suggested by Grot include fluorinated

hydrocarbons which, like Teflon, are typically hydrophobic, and their addition to the electrode would clearly alter the hydrophobic character of the electrode. As to the surfactant being for increasing the dispersibility of the materials, whatever reason they are added will still affect the eventual wettability of the electrode.

48. With respect to the discussion of Surampudi, the only argument the examiner can glean that is new in the continued discussion of this non-relied on teaching is that is demonstrates that fuel cell electrodes are not willy-nilly interchangeable. Whether or not that is the case, it is unclear why Surampudi need be further discussed. The pending rejections in question are not based on a willy-nilly interchanging of features, but based on explicit suggestions that Nafion be incorporated into gas electrodes for the reasons analogous to the present invention. See the 7/17/2003 examiner's answer in 90/006,209.

49. With respect to the arguments that none of the teachings drawn to further hydrophobic treatments would thereby render the electrodes liquid impermeable, the examiner does not see where the claimed invention requires permeable or even liquid impermeable electrodes. Moreover, the examiner does not see where Dempsey discusses the desirability of either permeable or liquid impermeable electrodes. All Dempsey discusses is that its electrodes must be gas permeable. That doesn't mean its electrodes are thereby liquid impermeable. Dempsey also presumably desires hydrophobic electrodes, but being hydrophobic is not synonymous with impermeability. It just means that the any liquid permeating through the electrode would not stick to the electrode.

50. Applicant argues that none of Grot, Uchida or Vanderborgh discloses whether its electrode is hydrophobic enough to withstand being immersed in water. However, the origin of

this whole argument about whether any of these electrodes could be submerged in water and not be subject to flooding was initiated by applicant's "new evidence" of Surampudi, which applicant alleged showed that you couldn't put Nafion in an electrode at a concentration of greater than 10% without causing flooding. However, the examiner has discussed in detail why Surampudi is irrelevant towards Grot, Uchida or Vanderborgh because Surampudi utilizes no further wetting treatments whereas each of Grot, Uchida and Vanderborgh do utilize further wetting treatments. Moreover, the examiner introduced Cisar which shows that Nafion including in an electrode will not inherently be plagued by flooding. See par. 60 from the affidavit. See also par. 62 from the affidavit which explained that it is not even necessary for the electrode of Dempsey to be submerged in water either.

51. In response to par. 61 from the affidavit, applicant that they need only discuss the obviousness of Nafion because Grot only disclosed embodiment used Nafion. However, the examiner's point in par. 61 remains. Except for a couple of claims, the claimed invention is not drawn to just the use of Nafion, Dempsey is not limited to the use of Nafion (col. 6, l. 57 - col. 7, l. 3), and Grot is not limited to the use of Nafion (col. 9, ll. 59-63, claims 1 and 3). If neither the claims being examined nor the prior art is limited to the just Nafion, then why would the analysis of the claims with respect to the prior art have to be limited to just Nafion?

52. Applicant urges that Cisar does not establish that Nafion has hydrophobic characteristics. First, this point appears to miss the larger issue as to why Cisar was introduced in the prosecution of 10/621,999. The examiner introduced Cisar to show that a Nafion containing electrode is not inherently prone to flooding as the applicant was urging with Surampudi. The relevant issue here is not whether Nafion is hydrophilic or hydrophobic, but whether an electrode containing

Nafion can still have it wetting properties controlled. For Grot, Uchida and Vanderborgh, the answer to that question was clearly yes because they utilize further wetting controls for the electrode. Second, applicant appears to equate the examiner's discussion of "hydrophobic character" as being the same thing as hydrophobic. In the discussion of Cisar, the examiner did not say Nafion was hydrophobic, but could possess hydrophobic character or could be made more hydrophobic by having higher backbone to sulfonic ratios. That much is irrefutable. The backbone of Nafion is a perfluonated polymer (the same backbone as Teflon), which is clearly a hydrophobic component. The more the mass of this polymer is made up of the hydrophobic polymer backbone, the more hydrophobic the polymer will be. As to applicant's request for further proof of this, Cisar says that higher sulfonic content would increase water retention (col. 8, ll. 57-59). If higher sulfonic content gives rise to higher water retention (i.e. hydrophilic character), then it naturally follows that a lower sulfonic content would retain water less and would be more hydrophobic.

53. Applicant continues to discuss Dempsey's use of flooding of one side of the electrolyte and how they believe Nagata and Tomantschger will change Dempsey's principles of operation. The examiner has covered these topics in depth in previous office actions, including in the affidavit, and will not reiterate those points here.

54. Applicant continues to traverse the examiner's use of *res judicata*. In particular applicant refers to the section 1214.01(I) as evidence that an affirmed rejection can be overcome. However, this apparently only pertains to rejections under 37 CFR 14.50(b), which would be claims 5, 13 and 57. As stated before (see par. 46 of the 12/30/2009 office action), prosecution

can not be reopened except for the subject matter to which the new rejection was applied (also in MPEP 1214.01(I)).

55. Applicant urges that the examiner cannot summarily rely on finding in an earlier Board decision to refuse consideration of the applicant's argument. The examiner has not ignored any of the applicant's arguments. See the response to arguments above. See par. 49-55 of the 12/30/2009 office action. See par. 59-71 of the affidavit.

56. Applicant's various arguments in section VI starting on p. 52, appears to reiterate arguments that they have made throughout the prosecution concerning Dempsey, Uchida, Grot, Vanderborgh (e.g. Dempsey's electrode is hydrophobic and that Dempsey relies on flooding of the membrane). The examiner has previously addressed the issues related to Dempsey (most recently par. 59-62 in the affidavit). The examiner has also addressed the arguments related to Uchida and their use of a separate coating of Nafion (see the arguments above as well as par. 63 from the affidavit). The examiner has addressed the issue of permeability or impermeability of an electrode above. The examiner has addressed the relevance Surampudi and the Nafion data sheet in par. 60 of the affidavit. The examiner has also previously addressed the issue of Hielscher being a different type of sensor (par. 50 from the 2/11/2009 office action). The examiner has addressed the issue of Dempsey with respect to Nagata and Tomantschger (par. 52-55 of the 12/30/2009 office action and par. 66 and 67 from the affidavit). No further comment on these portions of the remaining arguments is necessary, and the examiner will focus below only on the arguments that have not been covered in detail before.

57. As to the whole issue of Schroeder's paradox and the evidentiary teaching of Onishi, applicant's argument appears to be that Nafion will take up less water in the vapor phase than in

the liquid phase, and therefore Dempsey and/or LaConti would not have substituted the vapor humidified Nafion for water humidified Nafion. This argument is not persuasive for a number of reasons. First, applicant is essentially saying that one of ordinary skill in the art would not have done what LaConti already says can be done (col. 11, ll. 41-45) based on evidence (Onishi) that was published more than 20 years after the presumed time of the invention. How can one of ordinary skill in the art at the time the invention be held accountable for the contents of a paper published more than 20 years after the time of the invention? Second, except for claims 4, 56, 81 and 116, this use of vapor humified Nafion over liquid water humidified Nafion is irrelevant to the claimed subject matter. Using claim 1 as an example, this claim calls for a means containing water vapor. The liquid water container of Dempsey will contain water vapor because water will be in equilibrium with its water vapor. Moreover, Dempsey refers to just the use of water vapor as well (col. 7, ll. 50-56). Third, even if liquid water was known to provide a higher water content for the membrane, this still wouldn't read away from the use of vapor transport. In particular, Dempsey teaches that the membrane to be utilized is initially soaked in 100 °C water (col. 7, ll. 5-8). If a membrane is initially soaked in water before use (and already has the highest possible water content), then the vapor transport is merely functioning to keep the membrane hydrated (i.e. merely replacing any water that evaporates).

58. With respect to Hielscher (those arguments not previously discussed), applicant urges that Hielscher is drawn to making the counter electrode larger than the sensing electrode, whereas the claims require the surface area of the counter electrode exposed to the water be larger than the area of the sensing electrode exposed to ambient atmosphere. The examiner is entirely unclear what the distinction is here. Dempsey already taught the sensing electrode is

exposed to the ambient atmosphere and taught that the counter electrode electrode is exposed to the hydration source which could be water vapor (col. 7, ll. 50-56), and Hielscher discloses that it is a good idea to make the counter electrode larger than the sensing electrode, which is the same thing as saying the surface area of the counter electrode is larger than the surface area of the sensing electrode, then Hielscher renders obvious that the surface area of the counter electrode of Dempsey exposed to water vapor should be larger than the surface area of the sensing electrode exposed to the ambient atmosphere.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAJ K. OLSEN whose telephone number is (571)272-1344. The examiner can normally be reached on M-F 6:00-2:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Kaj K Olsen/
Primary Examiner, Art Unit 1724

October 29, 2010